

gradually declined till July 4, when its normal state was reached. The eruptions were again violent, with emission of lava from the 16th to the 23rd of July.

The mouths on the edge of the Sciara, which were contemporaneously active during the above period, were four in number—two at the northern end and two at the western end. One of the former pair was opened by the explosion of June 30, and from it was ejected the greater part of the detrital material of the eruption, so that around it a cone has been built up, truncated by a crater, sub-elliptic in form, of about 60 metres in maximum diameter. The height of this new cone above the old edge of the Sciara is about 50 metres. The other crater is situated on the deep fissure mentioned above, and at night, from the sea the incandescent lava could be seen in free communication with the atmosphere—a circumstance which explains the fact that the explosions from this crater were rare and of feeble intensity. The two western ones were situated one below the other with an interval of about 30 metres. Near the lowest, three large fumaroles gave forth dense columns of steam, while other lesser fumaroles were plentifully scattered about. The majority of the explosions took place from these two mouths. During this same period, lava was emitted three times, (1) on June 24, soon after the first two explosions from the most western part of the Sciara; (2) on June 30, from the crater on the fissure; (3) on July 16, from the central part of the Sciara, between the first two. They all reached the sea, and since the second stream doubled itself round an obstacle about half way in its course, four new points were formed on the shore. The thickness of the lava at these points varied from 4 to 6 metres. Specimens of the lava collected from the most western stream showed that it consisted of an almost homogeneous blackish-brown paste, compact in the interior, but becoming more and more porous and reddish in colour towards the exterior. Some of the larger cavities were internally covered with a shining brown patina. Externally it was covered with a rough crust, reddish-brown in colour, and of scoriaceous aspect. It was sensibly attracted by the magnet, and melted without effervescence to a brownish-green glass. Crystals of plagioclase, augite and olivine were apparent. In section, about two-thirds was rendered opaque and black by very minute microlitic granules of magnetite which were intimately mixed with a transparent glassy base, colourless or inclining to greenish. The remaining third consisted of a great number of colourless transparent microlites of plagioclase. Fluidal structure was only just apparent. In this microlitic paste were scattered crystals of plagioclase, augite, and olivine. The augites were greenish in section and possessed a feeble pleochroism. The olivines were corroded and irregularly fractured.

Analysis gave the following numbers:—

	Stromboli.	Etna. Mean of analyses of 20 modern lavas.
Silica...	50.71	49.45
Alumina...	13.99	19.30
Ferric oxide	5.13	11.82
Ferrous oxide	9.10	
Manganous oxide	.42	—
Lime...	10.81	10.21
Magnesia...	4.06	3.69
Potash...	3.02	1.33
Soda...	2.87	3.58
Loss on ignition	.24	—
Cl and SO ₂	(traces)	—
	100.35	99.38

The lava is similar to other lavas of Stromboli, and to show the great similarity between the lavas of Stromboli and Etna, the mean of the numbers of twenty analyses of modern Etna lavas is appended for comparison.

The scoria, lapilli, and ash of the eruption present no special features, but are what might be expected from a lava of the above composition.

Although the volcano had reached a state of comparative calm at the end of July, this did not last for very long. Towards the end of August fresh signs of activity gave warning of an approaching explosion, which took place on August 31. It was preceded by an earthquake a few seconds before, and as a result a vast column of ash rose above the volcano, while scoria and other projectiles were shot out to a considerable distance. Soon after, a fine ash, dark red in colour (instead of black as in

June-July), fell over the island, covering the ground in some places to a depth of several centimetres. On the evening of September 1 dense columns of ash were again emitted, and in the afternoon of September 3 the whole crater was enveloped in a thick mantle of steam, in the midst of which could be dimly seen a reddish-grey column of ash rising with extraordinary violence to a great height, when it spread out into a volcanic "pine." A fresh stream of lava was also observed. Eruptions succeeded each other at short intervals, accompanied by continuous rumblings, interrupted now and again by loud explosions, like heavy artillery. As far as could be observed, on the western side of the crater was a single mouth of almost circular form, 10 metres in diameter, which was most active in sending up vast columns of ash and projectiles of all kinds. To the east could be seen one or more little mouths, which tranquilly emitted large volumes of steam, while in the midst a large aperture, 30 metres in diameter, irregular in form and deeply fissured, was in powerful action. The activity, however, gradually quieted down, and towards the end of the year the volcano resumed its normal state.

In conclusion, it is useful to compare this eruptive phase of Stromboli with other contemporaneous seismo-volcanic phenomena of the Italian peninsula. It appears that earthquakes occurred in various districts in the early months of 1891, especially one on June 7 in the Verona district, rather severe, occasioning loss of life. Vesuvius was rather more active than usual during the whole of June, and in correspondence with this the great fumarole of the solfatara at Pozzuoli, increased in temperature. It is particularly interesting to note that Vulcano, the other active volcano of the Lipari Islands, remained in perfect calm during the whole period, emitting only vapour from the fumaroles. As, however, the character of the eruptions and the lithological composition of the material ejected from this volcano differ so greatly from those of Stromboli, it is tolerably certain that there is no free and direct communication between the reservoirs of these two volcanoes. In fact, Stromboli presents a much greater analogy with Etna. The similarity of the lithological composition of the lavas of these two volcanoes has already been referred to, and, further, Prof. Mercalli observes that the last four or five eruptions of Etna have all been immediately preceded or followed by a paroxysm at Stromboli. It is thus possible that there is a real relation between them.

L. W. FULCHER.

A LARGE METEORITE FROM WESTERN AUSTRALIA.

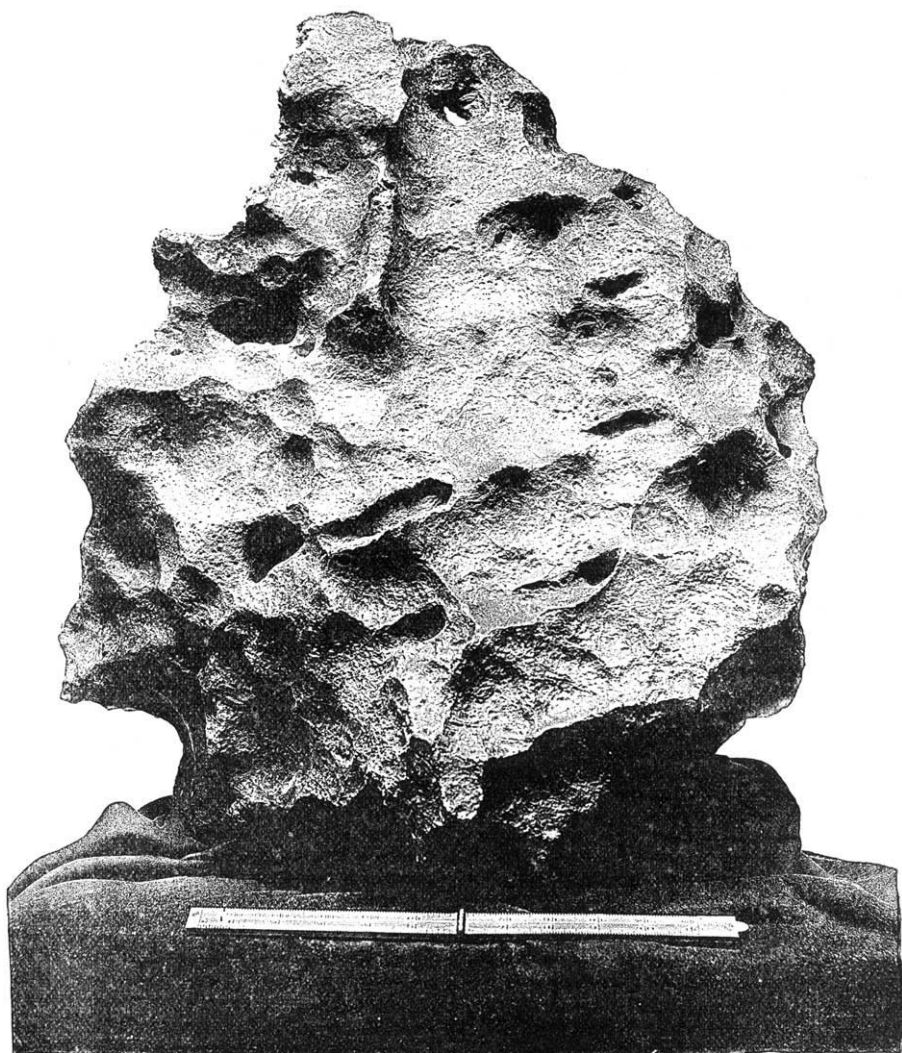
IN the *Mineralogical Magazine and Journal of the Mineralogical Society* of July, 1887 (vol. vii.) Mr. L. Fletcher, M.A., F.R.S., president of the Society, describes four specimens of a new meteoric iron found at Youndegin in Western Australia. They were discovered about three-quarters of a mile to the north-west from the top of Penkarrig Rock, in the above district, about seventy miles from York. These fragments were found by Alfred Eaton, a mounted police constable, when on duty in the district of Youndegin, when he brought in one of the four pieces he found on January 5, 1884. Mr. Fletcher states that the late Mr. Edward T. Hardman, F.G.S., the then Government geologist, expressed his belief in the meteoric origin of these iron masses. Later the above-named Alfred Eaton was sent with a native assistant with instructions to bring in the other three pieces, and at the same time an unsuccessful search was made for additional fragments. In the above account it is stated that the four pieces were lying loose on the surface, three of them close together, and the fourth fifteen feet away. They weighed respectively 25½ lbs., 24 lbs., 17½ lbs., and 6 lbs., the largest and smallest fragments are now in the British Museum collection, and the specimen of 24 lbs. is in the Geological Museum at Freemantle, and the fourth piece, weighing 17½ lbs., was presented to the Melbourne Museum in Victoria.

The new specimen now in my possession was discovered last year, and weighs 382½ lbs., and measures 22½ inches high, 20½ inches wide, and 13¼ inches in its greatest thickness. In form it is roughly convex on one side and concave on the other, on both sides of which are large depressions or pittings similar to those usually observed on other large masses of meteoric iron. It is somewhat triangular in outline, but with irregular sides. It has one small hole quite through the mass near the top, and numerous deep holes, one near the bottom left-hand corner

having a diameter of about $1\frac{1}{2}$ inches and 4 inches deep; another at the opposite bottom corner 2 inches deep and 2 inches in diameter; also another of 3 inches deep, and several others. On the upper edge especially, and at several other parts near, also on the edges, are fractured surfaces, as if in its fall a mass or masses were broken off, leaving a coarse crystalline structure, and which would indicate that several other large holes having existed before its fall on the earth, probably all or most of the pieces were connected together, and might have fallen in one mass. It would be interesting to know if any of the pieces fitted together at the fractured surfaces as seems to me might be

detach a fragment of which the cut face was not $2\frac{1}{2}$ inches square.

Mr. Fletcher also states that on treating a specimen of this Youndegin iron to the action of bromine water, or of dilute nitric acid, the polished section gave no definite figures, but assumed a damascened appearance very like the Tucuman iron and of that of Brazos, being very similar to the latter in the proportion and distribution of the Schreibersite; some specimens of the Arva, the Sarepta, and the recently found Canon Diablo are similar as exhibiting these characters.



One-fifth natural size.

possible. I observe that the two specimens of this iron in the British Museum collection exhibit similar fractures on the edges. Before receiving this specimen I was informed that two masses were found, but have no information at present as to the size and weight of the other.

Mr. Fletcher in his paper minutely describes the size and form of the two British Museum specimens, and that the specific quantity was determined from three small pieces from the larger specimen, and gave 7.86, 7.85, and 7.72. He also states that a portion was cut off the larger piece by means of hack-saws, and was found to be so hard that three weeks were required to

The Youndegin iron was also remarkable in containing the minute cubic and modified cubic crystals, having metallic lustre and of a greyish black colour, and which were determined to be graphitic in character, but of a diamond-like form; but were later found to be still distinct from the diamond, but having somewhat more the features of graphite. Mr. Fletcher therefore decided to give the name of Cliftonite to this substance, as being a new form of a carbon mineral. A most exhaustive description of this new mineral is given in his paper. Similar crystals of this substance are found in one or two other meteoric irons.

The composition of the Younegin iron was found to be as follows:—

Iron	92.67
Nickel	6.46
Cobalt	0.55
Copper	trace
Magnesium	0.42
Phosphorus	0.24
Sulphur	none
Insoluble cubes	0.04

100.38

JAMES R. GREGORY.

THE CROSS-STRIPING OF MUSCLE.

PROF. RICHARD EWALD of Strassburg, has just communicated a paper to the fifty-second volume of the *Archiv. f. d. ges. Physiol.*, in which he confirms Prof. Haycraft's views concerning the structure of striped muscle. The latter observer has held for many years that muscle fibrils are varicose threads, and that the cross-stripping is but an optical appearance due to this varicosity. The varicosity is often difficult to demonstrate in the ordinary way, and most histologists were not prepared to admit that the stripings are all and entirely due to it. Prof. Haycraft, however, recently brought forward to the Royal Society of London, and to the Berlin International Medical Congress, fresh and striking proof of the strength of his position, by demonstrating films of moist collodion, on which pieces of muscle had been pressed and then withdrawn. As a result of this pressure the collodion films were stamped as with a seal, and the impressions revealed in striking detail every stripe of the original fibre. Prof. Ewald confirms these experiments in the fullest manner, but suggests that the collodion impressions might be produced on the assumption that there are layers of hard and soft material alternating with each other in the course of the fibrils. In this case the hard material would press into the collodion and make a series of furrows, which would appear as a series of stripes when examined with the microscope. Prof. Haycraft had previously demonstrated the varicosity of the fibrils, seen by transmitted light, and had published photographs of his preparations, but Prof. Ewald was still sceptical upon this particular point, and sought to assure himself still more conclusively. With this end in view he examined muscle, which had been rendered quite opaque, by means of reflected light, for under these circumstances the influence of the internal structure would be entirely set on one side, and the surface of the fibrils would alone receive and reflect the illuminating rays. For purposes of illumination Prof. Ewald used the apparatus of W. and H. Seibert, of Wetzlar, by means of which vertical rays can be projected upon an opaque object; and he rendered his preparations, both of fresh and of hardened muscle, quite opaque by a method of over-silvering. Under these conditions Prof. Ewald found that the cross-stripping is most distinct, and he was able, with his admirable method of illumination, to examine the surface of a muscle just as one may observe the surface of the country at night by means of a search-light from an observatory. With the light perfectly vertical the tops of the ridges of the muscle are bright, and the valleys on either side in half-light. By shifting the light to one side or to another the slopes of the ridges can be thrown alternately into shadow or bright light. Prof. Ewald concludes by admitting that his experiments fully prove that the striping is due to the shape of the fibrils alone, and that the internal structure of the muscle plays no part in its production.

IRIDESCENT COLOURS.¹

ON taking a general survey of coloured objects, whether natural or artificial, we become aware of the fact that whilst the colours of some remain unchanged as regards tint, whatever their position in relation to the incident light, the tint of others varies with every alteration in their relationship to such light source. We thus see that so far as their colours

are concerned all bodies may be arranged in two groups according as their colours change or do not change in tint as their angular relationship to the light varies. Nor is this classification entirely an artificial one, since, as will shortly be seen, though this change in tint with variation in the light source is an essential difference, it is not the only difference, even in the colour manifestations of the two groups, for it is also characteristic of the nature of the colour-producing structure. It is to the above-mentioned varying colours that we apply the term iridescent, from the resemblance they have in the sequence or play of colours to the tints of the rainbow. The unvarying group of colours, having no equivalent term to "iridescence" to express the nature of their colour production, are spoken of as "pigmentary," or absorption colours. In naming examples of objects, natural and artificial, grouped as above in accordance with the nature of their colours, it is difficult to make a selection where all are so varied and characteristic. I have preferred therefore to cite only such instances as I myself possess, and am therefore able to show you. As examples of pigmentary colours, I need only name one or two for the sake of comparison, since the colours of most objects ordinarily met with are pigmentary. Leaves, flowers, dyes, birds, fish, insects, minerals, &c., exhibit these colours, some almost entirely, and all, excepting fish, in far the majority of instances. Of objects displaying iridescent colours we have also examples in the various divisions of the animal, vegetable, and mineral kingdoms. Amongst birds the most striking examples are found amongst the humming birds, sun birds, birds of paradise, &c. Insects, again, furnish numerous examples, more especially amongst tropical species, though not, perhaps proportionally in greater numbers than amongst those belonging to our own more temperate regions. The colours of fish are almost entirely iridescent, since their very whiteness, or silvery sheen, is due to the admixture of the iridescent colours of innumerable minute thin lamellæ, too small to be seen individually with the naked eye, but plainly perceptible under the microscope. In the vegetable kingdom iridescent colours are far more numerous than is ordinarily recognized, since the surfaces of the cell walls produce interference colours which are more or less obscured by the pigmentary colours of leaves and coloured flowers, but may be readily seen in the case of white flowers by the aid of a lens and sunlight. Under these conditions each cell may be seen to sparkle with its own iridescent colour, forming, by admixture of the interference tints of neighbouring cells, the varying shades of white seen in numerous flowers which are devoid of pigmentary colour. Mineral bodies displaying iridescent colours are also numerous; opals, sunstone, fire-marble, felspar, mica films, tarnish on various metallic crystals, certain crystals of chlorate of potash, &c., are examples.

In describing the various natural objects for purposes of identification, or mere description, no account can be considered complete which omits all reference to their colours, and more especially is this the case where the colours constitute such a striking feature, as in the case of iridescent bodies. In innumerable instances, more especially amongst birds and insects, their specific names are taken from some conspicuous colour they possess. It thus becomes evident that a correct description of the colours of bodies is of importance, and where these colours are of the pigmentary, or unchanging kind, this is a matter of no difficulty. How different, however, in the case of objects, the colours of which not only vary with every change of position, but disappear altogether, unless viewed with special relation to the light source. Nor can it be wondered at that descriptions of these objects, even by observers of undoubted repute, vary according to the different angles from which they have been viewed; or are vague and profuse, owing to fruitless attempts to describe their changing tints produced by every movement. The fact is, no words can convey an adequate impression of the gorgeous effects produced by most of such objects, whether birds, insects, or fish, when in motion in brilliant sunshine. Some notion of the difficulties to contend with in describing the colours of humming birds, for example, may be gathered from the remarks of Wallace in his work on "Tropical Nature," when speaking of humming birds:—"In some species they must be looked at from above, in others from below; in some from the front, in others from behind, in order to catch the full glow of the metallic lustre; hence, when the birds are seen in their native haunts, the colours come and go and change with their motion, so as to produce a startling and

¹ By Alex. Hodgkins on, M.B., B.Sc. Reprinted from the fifth volume of the fourth series of "Memoirs and Proceedings of the Manchester Literary and Philosophical Society." Session 1891-92.